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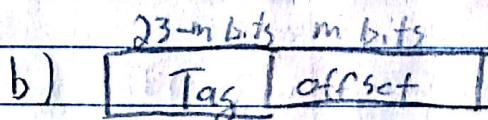
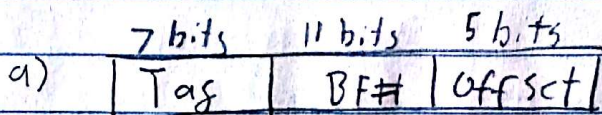
Cahlen Brascheau #154

HW #9

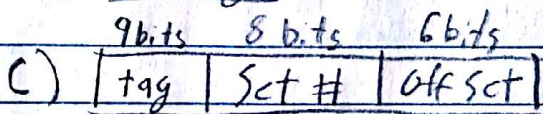
1)

$$8M = 2^{23} \quad 32 = 2^5 \quad BF = \frac{2^{16}}{2^5} = 2^{11}$$

$$64K = 2^{16}$$



block size:  $2^m$

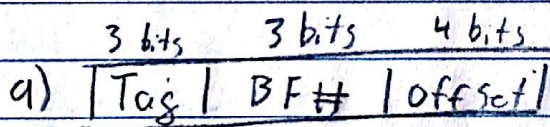


block size:  $2^6$

$$\# \text{ of BF} = \frac{2^{16}}{2^6} = 2^{10}$$

$$\# \text{ of sets} = \frac{2^{10}}{2^4} = 2^6$$

2)



Block size =  $2^4$

$$\text{Main/Mem} = 16 \times 64 = 1024 = 2^{10}$$

$$\text{Cache size} = 8 \times 16 = 128 = 2^7$$

$$\# \text{ of BF} = \frac{2^7}{2^4} = 2^3$$

b) to Binary (37A) = 110111010

Hit. Tag matches BF7's tag.

c) to Binary (22C) = 10010101100

Hit. Tag matches BF2's tag.

d) to Binary (1B9) = 0110111001

miss. tag doesn't match BF3's tag.



3)

4 bits 2 bits 4 bits  
a) 

tag	Set #	offset
-----	-------	--------

Set size  $\frac{2^3}{2^1} = 2^2$

b) 

1101	11	1010
------	----	------

Hit. tag matches BF7 in Set #3

c) 

1000	10	1100
------	----	------

Hit. tag matches BF5 in Set #2

d) 

0110	11	1001
------	----	------

Hit. tag matches BF6 in Set #3

4)

Main Mem = 1M words =  $2^{20}$  # of BF  $\frac{2^{12}}{2^4} = 2^8$   
Cache Size = 4K =  $2^2 \times 2^{10} = 2^{12}$

Block size = 16 =  $2^4$

10 bits 6 bits 4 bits 8 bits 8 bits 4 bits  
SA 

Tag	Set #	offset
-----	-------	--------

 DM 

Tag	BF #	offset
-----	------	--------

  
16 bits 4 bits  
FA 

Tag	offset
-----	--------

A)

0x949DA

1001 0100	1001 1101	1010
148	157	

i) Cache Frame # 157

ii) Tag must be 148



B)

1001 0100 1001 1101 | 1010

i) set # 29

ii) Tag = 10 bits

iii) 10 0101 0010 = 252

C)

1001 0100 1001 1101 | 1010

Tag = 949D

5

Main Mem = 32K =  $2^5 \times 2^{10} = 2^{15}$  # of BF =  $\frac{2^{12}}{2^3} = 2^9$

Cache size = 4K =  $2^2 \times 2^{10} = 2^{12}$

Block size = 8 =  $2^3$

FA 

12 Bits	3 bits
tag	offset

a)

$2^9$  comparators

b)

Size = 12 bits

c)

36 bits	9 bits	36 bits
DM	tag	BF#
		offset

Tag = 36 bits

1 comparator needed.



$$\# \text{ of sets} = \frac{2^9}{2^2} = 2^7$$

6)

$$\# \text{ of BF} = \frac{2^{12}}{2^3} = 2^9$$

$$\text{Main Mem} = 8 \text{K blocks} = 2^3 \times 2^{10} \times 2^3 = 2^{16}$$

$$\text{Cache size} = 512 \text{ blocks} = 2^9 \times 2^3 = 2^{12}$$

$$\text{Block size} = 8 = 2^3$$

DM | Tag | BF# | off set |

6 bits 7 bits 3 bits

a) 16 bits

SA | Tag | Set # | off set |

13 bits 3 bits

b)

FA | Tag | off set |

CA 49

1100 1010 0100 1001

off set = 001

c)

1100 / 1010 0100 1001

i) 329

BF# 329

ii)

1 Comparator of width 4 bits

D)

1100 1010 0100 1001

i)

Set# 73

ii)

4 Comparators, 6 bits wide



e)

i)

13 bits in each tag

ii)

$2^4$  comparators, 13 bits wide.

